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SEASON 1954-55

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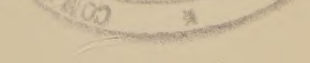

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For the 1954-55 season and subsequently the Progress Reports published in this series will be confined to those from territories in which members of the Corporation's staff are working. For 1954-55 the list will be:—

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NYASALAND

COTTON EXPERIMENT STATION, CHITALA
PROGRESS REPORT FOR THE SEASON 1954-55

BY

H. C. DUCKER.

There were no staff changes during the year, but preparations are in train for the transfer of Mr. J. M. Munro from Tanganyika in October 1955 to replace Mr. Ducker, who retires next year. Arrangements have been completed for the handing over of the Chitala station to the Department of Agriculture, and this will be the last report written with Chitala as the main station. Future work on cotton will be based on the Government station at Makanga near Chiromo in the Lower River, the major producing area in the current circumstances; observation plots will, however, be retained at Chitala.

District	*Elevation feet a.s.l.*	*Type of crop*	*Sown*	*Harvested*	*Legal close seasons*
Southern and Central Provinces	Approx. 200-2,500	Summer	Dec.-Jan.	June-July	Aug.-Nov.
Northern Province	1,600	Winter	May-June	Nov.-Dec.	Jan.-Apr.

Introductory Note.

Many parts of the Lake shore areas of the Central Province experienced their third successive year of shortfall in rain, and at Chitala planting rains were particularly sparse and difficult, no really effective rain falling till January 10th. The dry conditions were accompanied by hot sun and desiccating wind. The growing season was short in duration as well as late in starting, which accentuated the effects of pest damage. In other parts of the S.W. Lake shore, isolated heavy storms eased matters for the crops and built up the rainfall totals to more reasonable figures.

In the Southern Province, and particularly in the Lower River, the rains broke early and falls were heavy. Chikwawa had a total of 35·60″ compared with its mean of 28·75″, and Chiromo 35·37″ compared with a mean of 29·50″. Rainfall at the Cotton Experiment Station for the season 1954-55 totalled 26·52″, the distribution being as follows:

Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July
0·20	1·33	2·87	7·12	9·35	4·44	1·17	—	—	0·04

The season generally was not favourable for cotton, which made excessive growth in the wetter areas, but at Chitala growth was stunted by the very short growing period. Groundnuts did well in the Central Province, while maize suffered from the late short season and sorghum was the better grain crop at Chitala.

CL20 cotton was again grown by the Nyasaland Farming Corporation, but their Balaka farms suffered, not only from the heavy rainfall of the Southern Province, but also from a very severe attack of red bollworm followed by large stainer invasions and consequent *Nematospora* infection. Final yield figures are not yet available but the mean yield per acre is unlikely to exceed 400 lb. seed cotton, and a high proportion will be low grade. Yields at Chitala were similar. Including the Karonga crop harvested last December, the total Nyasaland crop is now expected to be about 12,000 bales (400 lb.). Though N. Nyasa did not have a very good year, owing to poor floods, the long staple trial planted on a good alluvial site at Kafikisila near Karonga gave excellent returns. Results are shown in Table 1.

Table 1.

Karonga Long Staple Upland Variety Trial.

	Lb. Lint per acre	*G.O.T. % roller*	*Wt. 100 Seeds grams*	*Lint Index grams*	*Halo Length mm.*	*Sound Seed % by count*	*Seed Cotton % Grade 1*
Wilds No. 11 ex Sudan	382	32·9	12·5	6·1	35·8	93·5	98·5
BP52 (C.50.20)	391	31·9	9·0	4·2	30·3	95·5	,,
CLA. ex Tanganyika	505	30·9	9·8	4·3	30·9	94·0	,,
47/10 ex Tanganyika	559	29·5	8·7	3·6	34·4	96·5	,,
CL20 ex Chitala	468	32·2	11·2	5·3	30·8	94·0	,,
CLB N Karonga Local	562	32·6	11·5	5·5	29·8	94·0	,,
S.E.	± 23						

The trial was planted on May 31st, 1954, and harvested in November and December. Weather in the latter month was very favourable for cotton picking, owing to the late break of the rains. The excellent conditions provided by winter cropping, with its virtual absence of pests and diseases, were confirmed. Saw-ginned and roller-ginned lint of the six varieties has been sent for spinning test, and the trial is being repeated; planting having been rather earlier than last year, about May 26th, the crop in September was promising.

Further developments with the commercial crop of N. Nyasa must depend on work with flood control and possibly irrigation, by the Water Development Branch of the Department of Agriculture.

Mechanisation.

The petrol driven tractor formerly in use at the station has been replaced with a diesel engined tractor which, to date, has proved most satisfactory. Further experiments with the disc ridger suggest that this may be improved by the provision of a land wheel to counteract the side-thrust of the forward discs, which tends to cause crabbing and uneven ridges. The heavy disc cultivator referred to in the last report has proved most useful and economised ploughing. It was particularly effective for breaking down old cotton ridges after uprooting, a cultivation which assists in red bollworm control.

Work with power-operated machines over the past six years at Chitala suggests that they have a future in Nyasaland as an adjunct to hand labour, which is still necessary for many purposes and seems likely to remain so for many years, largely for economic reasons. The soil here is hard on tools, especially in the dry season; upkeep costs are heavy and, as has been said before, the importance of the 'human factor' can hardly be over-stressed.

Cotton.

Six Albar 51 strains, selected at Chitala last year as high ginners and looking promising in the field, were compared with CLB, southern version, and CL20 as control types, in trials at Chitala, Makanga and Ngabu. Results are given in Table 2. The seed used was not treated with bactericide, and at both the Lower River stations severe stem lesions due to bacterial blight were noted on CLB and CL20. The disease was not so serious at Chitala, but at all three stations Albar 51 has showed to advantage beside the local cottons. Any damage to the bolls by bacterial blight was, however, completely swamped by stainer-carried *Nematospora* infection. This was particularly severe at Chitala, where the season was both short and late, and nearly as bad in the Lower River, where stainer invasions were early and multiplication of the pests was facilitated by the jungly growth of the crop, providing good breeding conditions. The column in Table 2 headed "Sound Seed % by count" was obtained by dissecting 200 seed samples taken at random in duplicate, i.e., 400 seeds per variety. All stages of damage, from a yellow spot on the cotyledon of the embryo, to completely dead and withered seed contents, were observed. Only the seed from clean white seed cotton apparently free from damage and saleable as grade 1 was used in these counts.

TABLE 2.

VARIETY TRIALS.

CHITALA	*Lb. Lint per acre*	*G.O.T.%*		*Wt. 100 Seeds grams*	*Lint Index grams*	*Halo Length mm.*	*Sound Seed % by count*	*Seed Cotton % Grade 1*
		saw	*roller*					
Albar 51-625	193	33·3	35·7	9·1	5·0	28·6	28·5	27·2
,, -629	166	34·4	37·3	8·1	4·8	28·6	29·0	28·1
,, -637	209	35·3	37·0	8·7	5·1	29·9	26·0	38·5
,, -639	237	34·3	36·0	8·3	4·7	27·7	25·0	41·6
,, -640	194	34·3	37·0	7·9	4·6	29·3	41·5	40·4
,, -645	217	38·0	38·8	8·0	5·1	28·6	39·0	38·4
CLB S	160	32·0	34·3	8·5	4·4	27·6	29·5	39·8
CL20	152	31·9	33·8	9·8	5·0	30·6	31·5	44·9
S.E.	± 18							
MAKANGA								
Albar 51-625	235	29·4	30·5	10·6	4·6	29·2	53·0	43·9
,, -629	156	30·1	33·1	9·5	4·7	29·4	40·5	53·5
,, -637	303	30·7	32·3	9·6	4·6	30·9	36·0	55·2
,, -639	382	29·3	31·4	9·4	4·3	27·8	38·0	63·0
,, -640	222	31·3	32·3	8·8	4·2	30·7	47·5	59·2
,, -645	239	33·0	35·0	8·7	4·7	29·6	40·5	55·6
CLB S	112	28·2	30·3	8·8	3·8	27·9	31·5	51·6
CL20	90	28·5	30·0	9·6	4·1	30·7	29·5	48·5
S.E.	± 19							
NGABU								
Albar 51-625	297	31·0	32·5	9·7	4·7	29·2	53·0	68·8
,, -629	253	32·7	34·3	8·6	4·5	28·7	45·0	69·4
,, -637	268	33·0	33·3	9·1	4·6	29·9	55·0	71·2
,, -639	270	31·2	33·3	8·8	4·4	28·2	47·5	70·9
,, -640	228	32·5	33·5	8·4	4·2	29·5	50·5	73·3
,, -645	261	34·7	35·7	8·1	4·5	29·4	50·0	64·1
CLB S	107	29·0	31·0	8·9	4·0	28·3	45·5	62·5
CL20	140	27·6	30·0	9·5	4·1	31·0	52·5	63·5
S.E.	± 28							

In February, when very wet conditions prevailed throughout the Lower River, jassid damage and effect became intensified and much of the crop, especially on land showing evidence of waterlogging, looked most unhappy. It is known that CLB is heterogeneous for jassid resistance, but the apparent breakdown observed was too general for explanation purely on genetic grounds, and it is believed that some physiological factors were at work, possibly disturbance of root activity. With improved weather towards the end of the rains the cotton grew away from the jassid effect, which never became so severe as to result in leaf death and shedding, except possibly in the case of certain full susceptibles. Albar 51-639, which gave the highest yield at Chitala and at Makanga and also did well at Ngabu, was judged to have resistance at about, or a little below, U4 level or standard. Further

study of resistance under the new conditions imposed by the early planting régime in the Lower River would appear advisable.

In 1954 at Chitala there appeared in the Albar 51 material some aberrant plants which died for no apparent reason at bolling time. Such plants were not observed in 1955, but in Albar 51-629 at Makanga a number of plants died of what seemed to be a *Fusarium* wilt. This strain gave the lowest yield of any Albar at both Chitala and Makanga, but did better at Ngabu.

The drop in ginning outturn, reported last year, continues in the Lower River, and there is about a 4% difference between varieties grown at Chitala and the same varieties grown at Makanga. There are however two factors to bear in mind when comparing figures in Table 2; ginning outturns of small quantities ginned by saw are likely to be somewhat in error, since it is difficult to clean-gin completely the last part of the gin roll; secondly, the roller gin figures are on carefully drawn duplicate samples while the saw ginning was done on all that remained of the seed cotton from each variety. The roller figures are the more accurate. A third factor is the effect of stainer cum *Nematospora* damage on the seed weights, which this season caused recorded outturns to be too high, by some 1%-2%. Some direct comparisons of seed weight are given in Table 5 in the discussion on stainer damage.

The shortfall in G.O.T. is definitely due to a lowered fibre weight and an increased seed weight under the new régime in the Lower River*, and the apparent inconsistency shown last year by Makanga grown cotton is largely explained by stainer damage to its seed. The mean figures in Table 3 were supplied by the B.C.I.R.A. Shirley Institute spinning tests carried out on CLB and CL20 material, from the 1953-54 trials.

These figures should be compared with Tables 3 and 5 on pages 4 and 5 of the 1953-54 Progress Report. The higher maturity, combined with lower fibre weight, of the Lower River cottons is most noticeable. Last year there was not much difference in lint length, but the 1955 halo measurements suggest that under the conditions of a wet season —1954 was rather dry—lint length of Lower River cotton is greater than that of the same variety grown up-country, under rainfall.

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*The spinning test results for the 1954-55 crop, received since this report was written, have thrown some doubt on this statement. The mean fibre weight, as opposed to the standard fibre weight, is the factor which affects G.O.T.; in the past two seasons the mean fibre weight has not differed appreciably between Chitala and the Lower River. The difference in seed weights is by itself insufficient to account for the lower G.O.T. at Makanga and Ngabu, and there is little difference in effective length. It would appear that some other factor, possibly fibre density per unit area of seed surface, is contributing to the consistent difference in G.O.T.

TABLE 3.

LINT AND YARN CHARACTERS.

	Effective Length 1/32"	*Maturity Ratio*	*Fibre Weight per cm.*		*C × S Product*	*Yarn Appce.*
			Mean	*Standard*		
Up-Country						
Chitala						
Roller ginned	37	0·80	156	195	2005	4·2
Saw ginned	36	0·80	158	197	1985	3·5
Tuchila						
Roller ginned	38	0·79	154	194	2055	3·5
Saw ginned	37·5	0·79	159	199	2046	3·5
Lower River						
Kakoma						
Roller ginned	38	0·88	149	169	2315	3·5
Saw ginned	36·5	0·85	151	176	2270	3·5
Ngabu						
Roller ginned	38·5	0·92	154	167	2200	3·2
Saw ginned	37	0·91	157	172	2264	3·2
Makanga						
Roller ginned	37·5	0·95	164	172	1986	3·7
Saw ginned	35·25	0·94	165	175	2038	3·7

The only spinning test results available so far for Albar material are from Chitala grown lint of the 1953-54 crop, but the above results would suggest that Albar 51 will produce rather better lint in the Lower River than it does up-country. Though nearly as long or as long as CLB and CL20 it is coarser than either and may be improved by fining down. The present indications are that Albar 51-637, which gave a C × S product of 2078 when grown at Chitala, may serve as a very useful stock for both central and Lower River areas if a compromise one-variety basis for the rain grown areas is desired. Such a seed supply would, however, mean a lower G.O.T. for the Lower River areas than that obtainable up-country.

NEW SELECTIONS.

With the help of the officers in charge of Makanga and Ngabu stations, hereby gratefully acknowledged, a large range of single plant selections, of CLB S and CL20 parentage, has been obtained. Plots of these varieties at each station were thinned to single plants and seed cotton from the earliest pickings only was retained for examination. It was hoped to emphasise the ginning shortfall to the utmost and so facilitate reselection for higher ginning material.

Some success was achieved with CLB, but it early became obvious that there is insufficient variation in CL20 to make reselection worth while. There is no future for this variety in the Lower River under the new régime, except possibly as a parent in crosses. Stainer and *Nematospora* damage to the seed made it necessary to discard a large number of the single plants of both varieties, but approximately one hundred and fifty CLB S selections have been retained for field study in 1955-56. A minimum G.O.T. of 32·5% under Lower River conditions, coupled with a minimum halo length of 27 mm., forms a general basis for selection, inferior values being discarded.

Crosses of Albar 49 with BP52 and CL20 in various arrangements have been in panmixis at Chitala since 1952. They have been heavily rogued for jassid and bacterial blight susceptibility and this year single plants have been selected from the F_4 material. About the same range of G.O.T. appears as in CLB S but, as might be expected, halo lengths are in general a millimetre or so longer. It is unfortunate that no direct testing of bacterial blight resistance has been possible, but it is believed that the best of this material is every bit as good as the best of the Albar 51 lots and that jassid resistance is higher in the crosses.

Bacterial Blight.

The commercial crop of the rain-fed areas was all sown with Perecot treated seed, and the general healthiness of the young plants was markedly good in all areas. Observation showed, however, that the very wet conditions in the Southern Province encouraged later infection, and the performance of CLB compared with more resistant Albar 51 strains in the varietal trials is suggestive.

Direct trials of Perecot dusted versus undusted seed on a statistical basis were confined to Chitala, and results are given in Table 4. Duplicate experiments superimposed on bulks of CL20 and CL20 filter bulk were laid out, but the late season made counts rather difficult.

Table 4.

Seed Treatment Trial.

	Mean % infection Leaf and Stem				*Seed Cotton Yields lb.p.a.*	
	Counts at 15.2.55		*Counts at* 12.3.55			
	T.	*U.*	*T.*	*U.*	*T.*	*U.*
CL20 Bulk	1·0	5·6	4·6	23·5	272	272
CL20 Filtered bulk	2·4	4·7	8·2	11·0	462	511
Means	1·7	5·1	6·4	17·2	367	391

T. = Treated seed, U. = Untreated.

Leaf and stem infections were significantly lower with Perecot at both counts, but the final yield differences were not significant. A boll analysis made in April showed 5·5% of the entire boll population of CL20 bulk and 6·8% of CL20 filter bulk to be infected with bacterial blight.

Insect Pests.

Bollworm, stainers and their associated fungi and bacteria are still the main obstacles to successful production of rain grown cotton in southern Nyasaland.

In the central areas represented by Chitala, the close season measures at present in use do nothing appreciably to control the ravages of red bollworm, *Diparopsis castanea* Hmps. The moths begin to emerge from pupation in December and reach a peak in late January or early February in time to do the maximum damage to the young crop. Such crop as is set is made late by the loss of early formed buds, flowers, and bolls, and more liable to damage by stainers and their associated diseases.

The conditions of the Lower River fortunately result in a slight difference in the life cycle of the bollworm, in that moth emergence from pupae which have carried over from the previous season does not begin in quantity until well into March, nor reach a peak until April. This means that there is time for early sown cotton to make a reasonable crop of bolls before the pest achieves large numbers, and before stainer attack becomes severe. With the very early and continuous rains of the past season it seems possible that red bollworm in parts of the Lower River did not receive a full check to its pupal development, since on the well drained and sandier areas of Chikwawa there was considerable loss of lower and middle crop. It is not thought that there has been any fundamental change in the life cycle, but merely that a seasonal fluctuation has occurred which will be corrected in a more normal year with an intense dry hot season.

What is more difficult and dangerous, is a definite rise in the stainer population of all summer crop areas, and the last two columns in Table 2 give an idea of the damage that this is causing by heavy *Nematospora* infections. The stainers involved are primarily *Dysdercus intermedius*, which commenced breeding on cotton this year as early as the first week of February at Makanga, and *D. fasciatus,* which appeared a little later. The damage is not just simply the degree of staining of seed cotton and the production thereby of grade 2 lint, but also the damage which is being done to the seed of apparently sound white seed cotton. The commercial buyings just completed show that out of a total of 8,589 tons of seed cotton from the three Provinces, not less than 2,423 tons were stained grade 2, an overall percentage of 28·2, while samples drawn from the seed produced by grade 1 seed

cotton from the Lower River are showing a viability of about 55%-65% only. The bulk of the damage is due to internal boll disease within the seed, and the percentage damage in Albar 51 stocks is as high as in CLB and CL20.

Apart from the difficulties which damaged seed imposes on planting, a large percentage of diseased seed will have a detrimental effect on the oil-milling industry which it is intended to establish in Nyasaland. The figures given in Table 5 presumably indicate a lowered oil content of inferior quality in the unsound seed.

Table 5.

Seed Characters.

Mean wt. per 100 seeds in grams. All varieties combined.	*Sound*	*Unsound*	*Unsound seed loss of wt. %*
Chitala variety trial	9·7	7·9	18·6
Makanga variety trial	10·6	8·2	22·7
Ngabu variety trial	10·1	7·7	23·8
Karonga variety trial	10·8	7·8	27·8

The figures from the Karonga trial are included as a matter of interest. Reference to Table 1 will show that only some 5% of seed from this trial was unsound compared with 40%-50% or more of the seed from the southern trials.

It would appear that a recommendation made in the Pearson-Mitchell report of 1945, that stainer control by the elimination of certain wild host plants will be necessary if these pests become troublesome, may have to be implemented. But before any active steps are taken to this end, further research, to establish which hosts are vital in maintaining the stainers over the close season, will be needed. In the meantime it is to be hoped that the stainers, too, have been helped by the past rather inclement season, and that a drier year will serve to check their activity.

Husbandry and Rotation Crops.

Fresh experiments with rotation crops were planned as part of the general trials by the Department of Agriculture.

A groundnut variety trial gave excellent yields, and again emphasised the advantages of early bunch types as high yielders. These types are, however, rather unsuited to the African style of agriculture with its leisurely harvesting, and a search is being made for varieties of which the nuts enter into a dormant stage after ripening and which are sufficiently high in yield.

A maize variety trial compared established varieties with some new strains bred at the Agricultural Research Station of the Department of Agriculture at Lilongwe. Results from this and from the groundnut trial will be published elsewhere.

The medium-term sorghum Karinaka, seed of which was supplied by Chitala to the Department of Agriculture, was issued in the Chikwawa district of the Lower River and proved most successful. The growers were well pleased with their crop. This sorghum has again given good yields at Chitala and its stover and stubble appear to be relished by the cattle.

Three observation plots sown with Rhodes grass, *Chloris gayana,* have grown well, and not only is this grass attractive to grazing cattle but the timing of its flowering is such that it should lend itself admirably to hay-making at Chitala in future years. Under the new cropping plans for this station a considerable acreage is available for ley lands.

The cattle continue to flourish, and the herd has tripled its strength by natural increase. The numbers are now somewhat of an embarrassment since kraal accommodation was originally intended for only a dozen or so beasts. The Veterinary Department has begun to dispose of the surplus by sale to local Africans, and new kraals may be built at some future date.

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